

Old Age - Research

THE LONGITUDINAL METHOD IN OLD AGE RESEARCH

Harold E. Jones, University of California

INSTITUTE OF
INDUSTRIAL RELATIONS

RECEIVED

JUL 31 1950

THE LONGITUDINAL METHOD IN OLD AGE RESEARCH

Harold E. Jones, University of California

The longitudinal study of age changes is perhaps the most expensive, and certainly the most time-consuming research method with which psychologists have concerned themselves. Our continuing interest in this method arises partly from the ambiguity of cross-sectional data in the portrayal of age differences, and partly from the fact that there is no possible substitute for longitudinal records if our interest is in the dynamics of age changes.

Limitations in Cross-Sectional Data

To review briefly some of the limitations of our present research materials, which are based chiefly on cross-sectional studies, we are quite aware that there are many factors, very difficult to control, which may disturb comparability of different samples obtained at different age levels. Particularly in later maturity, the selection at successive age levels may be progressively changed by differential morbidity and survival, as Eysenck (2) and others have pointed out. With regard to age changes in mental abilities, with which this paper is primarily concerned, the effect of differences in schooling among samples at different ages has been noted by Lorge (4, 5) and by Shakow and Goldman (8), and Morris (7) has emphasized the effect upon test performance of the length of time from schooling.

Differences among age groups in sensory and motor factors, in speed, and in motivation are also frequently cited as playing some part in the apparent age differences in mental test scores. After using various devices to allow for or correct for these factors, Jones and Conrad (3) still found a marked age decline. Lorge (4) has attempted to correct for the speed factor, and by his method this correction alone appears to eliminate the downward trend in the Jones-Conrad data. It seems probable that the conflicting interpretations based on different analyses can never be fully reconciled until we turn from the comparisons of scores obtained by different samples, to a comparison of scores at different ages in the same individuals.

The Problem of Comparability of Test Scores

However, at some points the longitudinal method may appear to suffer from the same difficulties as the cross-sectional method. One such difficulty is deeply imbedded in our techniques of testing. From the work of Shimberg (9) it is known that the performance of urban and rural children on mental tests depends partly on how the tests are constructed. Rural children are handicapped on a test standardized and validated on urban children, but on the other hand city children do poorly on a test made up of rural content validated on rural cases. Either test is reasonably effective on either cultural group, but neither test is fully satisfactory if

you wish to compare the two groups, or if you wish to determine individual differences in a heterogeneous sample.

Do we have a similar situation in comparing older and younger adults, or older adults and adolescents? For both the Wechsler (10) and the Miles (6) investigations it has been computed that at the age of 50 the mean score was about half a sigma below the average for ages 25 to 40, and a full sigma below the average for age 20. In the Jones-Conrad study the apparent decline was somewhat less, but still great enough to appear practically as well as statistically very significant.

When we amuse ourselves by drawing these cartographically very precise age curves from adolescence into later maturity, we seem to imply a certain faith in the comparability and continuity of our measures. It would of course be possible to present, in a single age curve, the length of legs to age 20, the height of the vertical jump age 20 to 40, and the percentage of movement responses in the Rorschach age 40 to 60, and having done this we might then discuss the general characteristics of the curve and even present an equation for it.

This would readily be recognized as a very silly undertaking. Should we also consider as perhaps only a smaller degree of nonsense an age curve for mental ability, based on the same test at different ages? We admit that the test

can only be superficially the same, since its nature, as a measuring instrument, will vary according to many non-intellectual factors which also vary with age. Moreover, the composition of intelligence may vary, with differential age changes in component mental functions.

It is not merely a question, then, of a rubber yardstick, but even worse than that, of fluctuating incommensurables which are treated as though they were one variable. In view of the foregoing, one can hardly quarrel with the modest conclusion that our existing curves of growth and decline are misleading in their precision and in their simplification of growth changes. And yet it can probably be said that few of us doubt the general validity of a picture showing, in terms of acceptable definitions of mental ability, a peak in the late teens or early twenties, and a subsequent decline which, on the average, becomes of considerable magnitude beyond 50. Few of us doubt that there are implications from such an age curve, for personal adjustment, for intellectual production, for employment.

Physical Analogies of Mental Decline

If we turn to physical analogies we have from anatomists an impressive story of organic changes in senescence--of hardenings and softenings; adhesions and loosening; thickenings and thinnings, and all the other reductive or expansive changes which characteristically go with age and which

are abnormal only by reference to the anatomy at the prime of life. Similarly we have evidence of many functional reductions, apparent even as early as the forties, which almost seem to justify the line by Pope that years following years steal something every day. Fortunately, the impairments are rarely visible day by day, as behavior gains in infancy, as reported by Gesell, are evident from one day to another. But age impairments do occur, and it would be surprising indeed if intellectual processes in the fifties and sixties, as well as later on, were wholly exempt from the senescence which affects so many aspects of sensory and motor function, so many aspects of tissue structure and tissue activity.

In individual cases we may point to compensating factors, in judgment, emotional balance and work habits, and yet even here we may in general be on doubtful ground. Physiological homeostasis probably decreases in the older person, and at least with regard to abilities psychological balancing factors cannot usually be expected to become more adequate with the passage of time, although a decline in the aspiration level, in relation to declining levels of performance, may afford a balancing factor in personal adjustment. When we refer to physical changes in later maturity we of course intend no direct implications as to psychological change. From physical analogies we can only draw preliminary hypotheses. Our present task, in searching for more adequate evidence, is to locate methods which will not suffer

from the handicaps of those previously employed.

Individual Variations in Age Change

In this connection, one of the advantages of the longitudinal method would seem to be that it permits us to observe processes, rather than merely differences between static measures. It permits us to observe changes in a given measurement with reference to the person, and not merely with reference to the standard scores of a distribution.

There is another important advantage of the longitudinal method, in studying development in childhood and adolescence, namely that it presents results which can be freed from the effects of individual differences in maturing. Thus, we know that an average growth curve, as for height, if based on cross-sectional data will show a quite smooth and regular course of growth in adolescence. But the growth curve of an individual, observed cumulatively, will almost surely present rather marked irregularities or changes in rate, as a manifestation of the puberal cycle.

Since growth spurts occur at different ages in different individuals, they tend to cancel each other out in a curve based on averages at successive ages. We have reason to believe that at the other end of the age scale there are also individual differences in the rate of age change, and these are not briefly manifested but extend through decades. It is these individual differences, and their associated factors,

that are actually our greatest interest in old age research, and we have no way of revealing them except by repeated measurement.

In adolescence, an assessment of early and late maturing may be quite important for prediction and for individual guidance. We do not, however, feel that within a normal range of cases and within a normal range of environments much can, or should, be done to modify basic rates of maturing. Among older persons, on the other hand, individual variations in aging may not only become more predictable than they are at present, but we cling to the belief that they may also become more controllable, if we can learn more about associated factors in the individual's physiology and in his life history.

Points of Emphasis in Longitudinal Studies

This brings us to the question of what the principal points of emphasis should be in a longitudinal study. John Anderson (1) has pointed out that psychologists are now somewhat less concerned than formerly about the precision of measures, and somewhat more concerned about problems of sampling. Longitudinal studies have a different point of emphasis, namely, in the enlargement of the field of measurement, the broad extension of the age variables which are considered. Wherever a longitudinal study is set up, this calls for a great deal of prior planning and for pre-tests of procedures, for when an investigation is under way you will be wedded to it for a

long period of years. It is possible to divorce some variables if they are contributing too little to the program, but one cannot be promiscuous in adding new variables. There is a further limitation that if the ideal of continuity of measurement is to be maintained, after you once begin you cannot even do much about improving your techniques or adopting new and more up-to-date procedures. Thus, by the time a longitudinal study gets its subjects into advanced years, it may itself be senescent in terms of method and perhaps also of theory. We should not be too discouraged by this, for senescence in research is inevitable if there is growth in research, and there is a way of keeping up with growth--namely by starting a new and better longitudinal study every few years, and carrying forward overlapping studies.

When we consider in more detail the variables that should go into a longitudinal program, we are struck by the fact that up to this time there has been so very little broadly interdisciplinary research on old age. We have had studies of intellectual functions, sensory and motor functions, of social adjustment in old age, of interests and attitudes, psychiatric studies, physiological and anatomical studies, but usually with little attempt at a unified approach. An interesting early example of a multi-variable study is that of the Galton Laboratory, and more recently perhaps our best example is the series of studies directed by Miles. But here the role of the physiologist or physician was rela-

tively small. It appears to be difficult to cross the line between the social and biological sciences. We are not without examples of correlated investigations in each of these fields, but any individual guardian of private or public research funds usually operates in one field or the other, and is not always eager to appraise undertakings along a wider front.

Some of us who are particularly interested in mental growth and decline would like to see a longitudinal study in which a range of intellectual functions are sampled, with and without time limits; with tests of trial and error and rational learning; of immediate and delayed recall; and along with this battery of measurements a record of many specific physiological aspects of aging. The interpretation of mental decline will also require some record of attitudinal factors, of responses with and without special motivational devices, and of mental output in work periods of varying length.

Thorndike's studies of adult learning provide many examples of research ingenuity, but without means for correlating various aspects of mental and physical trends. The relationship through time of psychological and biological changes, the lag of one upon the other, or their parallel movement, may add to our merely descriptive records some better understanding of the dynamics of senescent decline, and as a next step may lead to experimental procedures which will test specific hypotheses.

A Proposal for a "Federated" Study

In setting up such a program, how much attention should be given to sampling? Sampling is not our major problem when we attempt to portray changes in the individual. We are less concerned about the representativeness of our group as a sample, than about the representativeness of the data collection for an age span covered longitudinally. However, it is obvious that we cannot be satisfied with samples made up largely of abnormal cases. In his 1944 review, Lorge (5) pointed out that in the preceding three years nearly all of the work on intellectual changes in maturity and old age was concerned with the results of intelligence testing in psychotics. Obviously we cannot continue to limit research to institutional cases who happen to be conveniently available. As one who has always advocated devoting our chief resources in child psychology to a normal range of children rather than merely to clinic referrals, I shall have to recommend that in studies of maturity and old age we pick our subjects from the general population and not principally from hospitals or consultant centers. But it is not necessary to have a stratified sample in the exact proportions found in the census. From some points of view it would be more advantageous to set up a series of different samples, each relatively homogeneous, in different research centers. Thus we should have a rural sample composed entirely of small farmers, and their wives; a sample of urban day laborers; of mechanics; of salesmen; of tradesmen or small

shop owners; of members of a specific profession such as school teaching.

One reason for proposing this type of research organization is because a study with adults, and particularly a cumulative study, requires a great deal of attention to incentive and rapport. The technique for applying incentives and maintaining motivation will be very different among farmers and, for example, among urban school teachers. The writer once drew up a report on the technique of mental test surveys among adults. This was derived from experience with rural groups in New England. It is doubtful if there are many useful suggestions in it, applicable to emeritus Chicago policemen or New York shopkeepers. It will be well for each research staff to specialize on techniques for a special group, rather than to attempt to cover the whole occupational or socio-economic range.

If it is eventually feasible to set up such a series of projects in different universities, an advisory agency composed of members of several interested groups should devote at least a year to planning research procedures, which can be followed in the different centers in a sufficiently standard way to yield comparable results, and which will have enough significance to justify a long period of repeated record taking. The advisory group should include persons qualified in statistical method, including time series statistics, and also persons experienced in dealing with only partially

quantified or clinical records. All quantifiable data should be put on punch cards, with a standard form of statistical treatment, and with duplicate cards to be maintained in a central office; interviews and other qualitative records should be copied and copies kept in the central file.

We come now to certain administrative problems which are involved in any longitudinal study, and which may be a particular matter of concern in a federated study, requiring different staffs in different institutions. The lone wolf motif is still strong among scientific workers, many of whom are most efficient and productive when they are left to their own introvert devices. But the type of project we are now envisaging demands rolling up our individual iron curtains and working as a team rather than as isolated star performers.

When we overcome this problem of scientific isolationism, we have the further problem of finding a sufficient number of persons who can be depended upon to have the long-term interests and the long-term vitality to carry on the kind of a study that has been proposed.

One of our first tasks must obviously be to recruit and train personnel. But we already have the personnel for an interdisciplinary national advisory committee, and it is not too early to begin a comprehensive program of research planning. If we can look forward to the eventual establishment of old age research centers in a number of universities,

I would propose that in each of these institutions an inter-departmental committee be organized, with representatives from cooperating departments--psychology, sociology, and wherever possible other departments in the social, biological and medical sciences. Before research can actually be undertaken, there must be some assurance of continuity of staff and of continuity of interest.

At Berkeley we have in one of our longitudinal programs, the Berkeley Growth Study, a staff worker (Dr. Nancy Bayley) who has been on the job continuously for 21 years--and throughout this period, except for one leave of absence, she has been in direct personal contact with the subjects of the study and with their parents. It is not always easy to plan in terms of such a degree of loyal persistence, for one of the characteristics of a longitudinal study is that it demands a willingness to do the same or similar things year after year, and to postpone research fulfillments for many years. This is not a temporal pattern that will appeal to an investigator who likes to set up and complete an experiment during the Christmas vacation.

A second problem is that of publication. The willingness to postpone publication is a virtue that can be overdone. It is well-known that workers in longitudinal studies sometimes become so buried in successive layers of data that they never fight their way out of the smothering encirclement of their own filing cases.

It is partly for this reason that in a federated study a central administrative office may be necessary. In the main, it should be the responsibility of each staff to publish its own material, but there will be publications involving the total body of material, and there must also be some machinery for getting out reports where a research unit has for any reason failed to do so.

There are administrative issues here which may lead to difficulties, but it is here proposed that the best solution is to have a headquarters office with a long-term budget, and field staffs in various universities with annual budgets subject to renewal. This implies inter-university contacts through conferences and exchange appointments, and perhaps a fellowship program in which men who have been trained at one center will be aided in their predoctoral or postdoctoral work at other centers.

An additional problem, for which there can be no single answer, is that of the age at which subjects should be enrolled in a study, and the frequency of contacts with the subjects. For the main program, it may be suggested that age 45 or 50 is a feasible beginning point, but for special purposes intensive work will be desired with older subjects, and at least one sample should be started at a considerably earlier age.

As to the time intervals, some aspects of the data collection may require annual measurements. Others may be safely left to longer periods. However, it is desirable to keep

in fairly continuous contact with subjects during times of disturbed health, and one way of doing this, and also of inducing cooperation from the subjects, would be to conduct the study in connection with some form of an institutionalized health plan, with dues provided by the study, to cover physical examinations, certain routine laboratory tests, and certain medical services.

At this point, if not much earlier, the question may be raised as to whether these general proposals do not lead in the direction of fantasy rather than of realistic scientific work. We have been thinking in terms of a 20-year longitudinal study, costing perhaps \$200,000 a year. Associated with the main project there would be many subsidiary studies, financed from other sources. As large as the main budget may seem to be, it represents only 1/100 of 1% of what has officially been proposed to President Truman as the minimum needed level of expenditure in this country for private and public research. Surely this is not an unreasonably large fraction to devote in these times to a national and inter-disciplinary study of old age problems. In any event, the suggestion may be made that in planning any local study on old age, the procedures should be formulated in such a way as to permit integration with a broader research if and when it can be undertaken.